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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/618,228	07/11/2003	Balgovind K. Sharma	SC12589TP	4406
7590	12/22/2004		EXAMINER	
John A. Forkort P.C. 4512 Court of St. James Austin, TX 78730			TRAN, BINH X	
			ART UNIT	PAPER NUMBER
			1765	

DATE MAILED: 12/22/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/618,228	SHARMA, BALGOVIND K.
	Examiner	Art Unit
	Binh X Tran	1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 11 July 2003.
- 2a) This action is FINAL. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 1-21 is/are rejected.
- 7) Claim(s) _____ is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>7/11/2003</u> . | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Information Disclosure Statement

1. The examiner considers all the references submitted under the information disclosure statement filed 7-11-2003 except the reference title "International Sematech, Low-K Dielectric" because applicants fail to submit a copy of the above reference. It has been placed in the application file, but the information referred to therein has not been considered. See attachment PTO-1449.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 2-4, 6, 9, 15-17, 19-20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 2, "the solution" lack antecedent basis. The examiner suggests replacing "the solution" with --the micellar solution--.

Claims 3-4 are indefinite because they directly or indirectly depend on indefinite claim 2.

In line 2 of claims 6 and 19, "the hydrocarbon solution" lacks antecedent basis. It is unclear from the claim whether or not that the applicants refer a "hydrocarbon surfactant" as "the hydrocarbon solution".

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In claim 9, "the solution" lack antecedent basis. The examiner suggests replacing "the solution" with --the micellar solution--.

In line 5 of claim 15, "the substrate" lacks antecedent basis. The examiner suggests replacing "the substrate" with --the semiconductor substrate--.

Claims 16-17 are indefinite because they directly depend on indefinite claim 15.

In line 2 of claim 20 "about 0.01% to about 1% hydrocarbon surfactant" (emphasis) is indefinite because it is inconsistent with previous claim 19. In claim 19, applicants recites that the hydrocarbon surfactant is present at "a concentration of less than about 1% by weight". Once, the applicants claim the range of "less than about 1%", the applicants cannot broaden the range the claim by including to about 1%.

In line 3 of claim 20, "EGMBE" is indefinite. The examiner suggests the applicants to disclose the specific chemical name that "EGMBE" stands for in order to avoid any confusion.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-3, 6, 8, 12, 14-16, 18-19 are rejected under 35 U.S.C. 102(b) as being anticipated by Robinson et al. (US 6,103,627).

Respect to claim 1, Robinson discloses a method for cleaning a semiconductor device comprising the steps of:

providing a semiconductor device;

applying a micellar solution to the semiconductor device (col. 3 lines 55-67).

Respect to claims 2-3, Robinson teaches the semiconductor device contains at least one opening, and the opening has processing residues on a surface thereof which are formed during the creation of the opening, and wherein the micellar solution is applied to the opening to remove the processing residue (Fig 2, col. 5 lines 25-55).

Respect to claims 8 and 12, Robinson teaches the micellar solution comprises a surfactant having at least one carbonyl group (i.e. carboxylic acid) including citric acid (See col. 3 lines 55-67). Respect to claim 14, Robinson discloses the semiconductor device comprise silicon surface and the micellar solution is used to clean the surface (col. 3 lines 55-60).

Respect to claim 15, Robinson teaches a method comprising the steps of:

providing a semiconductor substrate (12) having a plurality of openings therein, the opening having a processing residue disposed on the surface (Fig 2);

applying a micellar solution to the semiconductor substrate to remove a portion of the residues from the plurality of the openings (col. 5).

Respect to claims 16 and 18, Robinson teaches the processing residue is formed during the etching process (col. 5 lines 33-52). Respect to claims 6, 19, Robinson discloses the micellar solution comprise hydrocarbon surfactant at of concentration of less than 1% by weight (col. 4 lines 18-22).

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6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Robinson in view of Lee et al. (US 6,825,156).

Respect to claim 4, Robinson fails to disclose that the residues include organometallic polymers. Lee discloses the semiconductor device has a metal plug for contact and has organometallic polymers residue (col. 12 lines 55-65, col. 19 lines 24-45). Lee further teaches the organometallic polymers residues are removed using a solution comprise surfactant. It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Robinson in view of Lee by removing the organometallic polymer residues because it will help to create a clean surface contact.

8. Claims 5, 9, 13, 17, 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Robinson in view of Aoki (US 6,423,148).

Respect to claims 5 and 21, Robinson fails to discloses the semiconductor device has a bulk dielectric constant below 3.0. However, Robinson clearly discloses the semiconductor device has a low k dielectric layer. In a semiconductor process, Aoki teaches to use low k dielectric of $k = 1.8$ or $k = 2.8$ (within applicant's range; col. 7 lines 28-42). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Robinson in view of Aoki by using a device has a dielectric constant

below 3.0 because low dielectric constant is capable of reducing the electrostatic capacity.

Respect to claim 9, Robinson fails to disclose the solution comprises oxalic acid. However, Robinson clearly teaches that the solution comprise citric acid. Aoki teaches to use a solution comprise either citric acid or oxalic acid to remove residues (col. 6 lines 30-45). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Robinson in view of Aoki by using oxalic acid because equivalent and substitution of one for the other would produce an expected result.

Respect to claims 13, 17, Robinson fails to disclose that the semiconductor device contains copper levels. Aoki teaches to use copper in the semiconductor to create interconnection and via hole (col. 6 lines 45-50). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Robinson in view of Aoki by having copper levels because they will create interconnection and via hole.

9. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Robinson in view of Bessho et al. (US 6,440,856).

Respect to claim 11, Robinson fails to disclose that the solution comprise ethylene glycol monobutyl ether. In a cleaning method using surfactant, Bessho teaches to use ethylene glycol monobutyl ether as a solvent. It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Robinson in view of Bessho by using ethylene glycol monobutyl ether because this organic solvent is hydrophilic and soluble in water.

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10. Claims 7, 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Robinson in view of DeYoung et al. (US 6,641,678).

Respect to claim 7, Robinson fails to disclose the micellar solution comprises a fluorocarbon surfactant. However, Robinson clearly discloses that the micellar solution comprise a carboxylic acid surfactant. In a cleaning method, DeYoung teaches to use either carboxylic acid or fluorocarbon surfactant (col. 6 lines 20-24). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Robinson in view of DeYoung by using fluorocarbon surfactant because equivalent and substitution of one for the other would produce an expected result.

Respect to claim 10, DeYoung disclose the solution comprises aqueous solution of fluoro-surfactant and HF acid (col. 5 lines 22-35 and col. 6 lines 23-25). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Robinson in view of DeYoung by using aqueous solution of fluoro-surfactant and HF because it will enhance and facilitate the cleaning process.

Allowable Subject Matter

11. Claim 20 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

Conclusion

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Binh X Tran whose telephone number is (571) 272-

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1469. The examiner can normally be reached on Monday-Thursday and every other Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Binh Tran

Binh X. Tran